

*With*

117. The composition of Claim 114 wherein the macrocycle is complexed with a cationic species and the cationic species is a lanthanide or actinide cation.

## **REMARKS**

### **I. Status of the Claims**

Claims 2, 3, 5-90, and 92-94 are canceled. Claims 1, 4, and 91 have been amended herein. Claims 95-117 are added. Claims 1, 4, 91, and 95-117 are pending. Amended and added claim language find support in the specification as filed, so that new matter has been added. The calix[m]pyridino[n]pyrrole embodiment removed from Claim 1 has been written as independent claim 111. The calix[m]pyridine embodiment removed from claim 91 has been written as independent claim 114. No elements of the amended claims are believed to be narrowed by the amended language.

### **II. Restriction Requirement**

The Office Action defined 29 inventions. Group II is no longer in the restriction.

#### **Response**

Applicants elect, without traverse, the invention of Group I to Claims 1, 4, 79, and 91 as reflected by the claim cancellations. Claim 79 has been canceled. Applicants reserve the right to file a divisional application on the nonelected inventions.

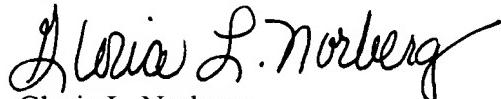
### **III. Inventorship**

The inventorship is correct for the election of the Group I invention.

#### **IV. Conclusion**

It is believed that all matters of the Office Action have been addressed. Reconsideration and an early indication of the allowability of Claims 1, 4, 91, and 95-117 are earnestly requested. Should the Examiner have any questions, comments or suggestions that would expedite the prosecution of the present case to allowance, Applicant's undersigned representative earnestly requests a telephone conference at (512) 499-6200.

Respectfully submitted,



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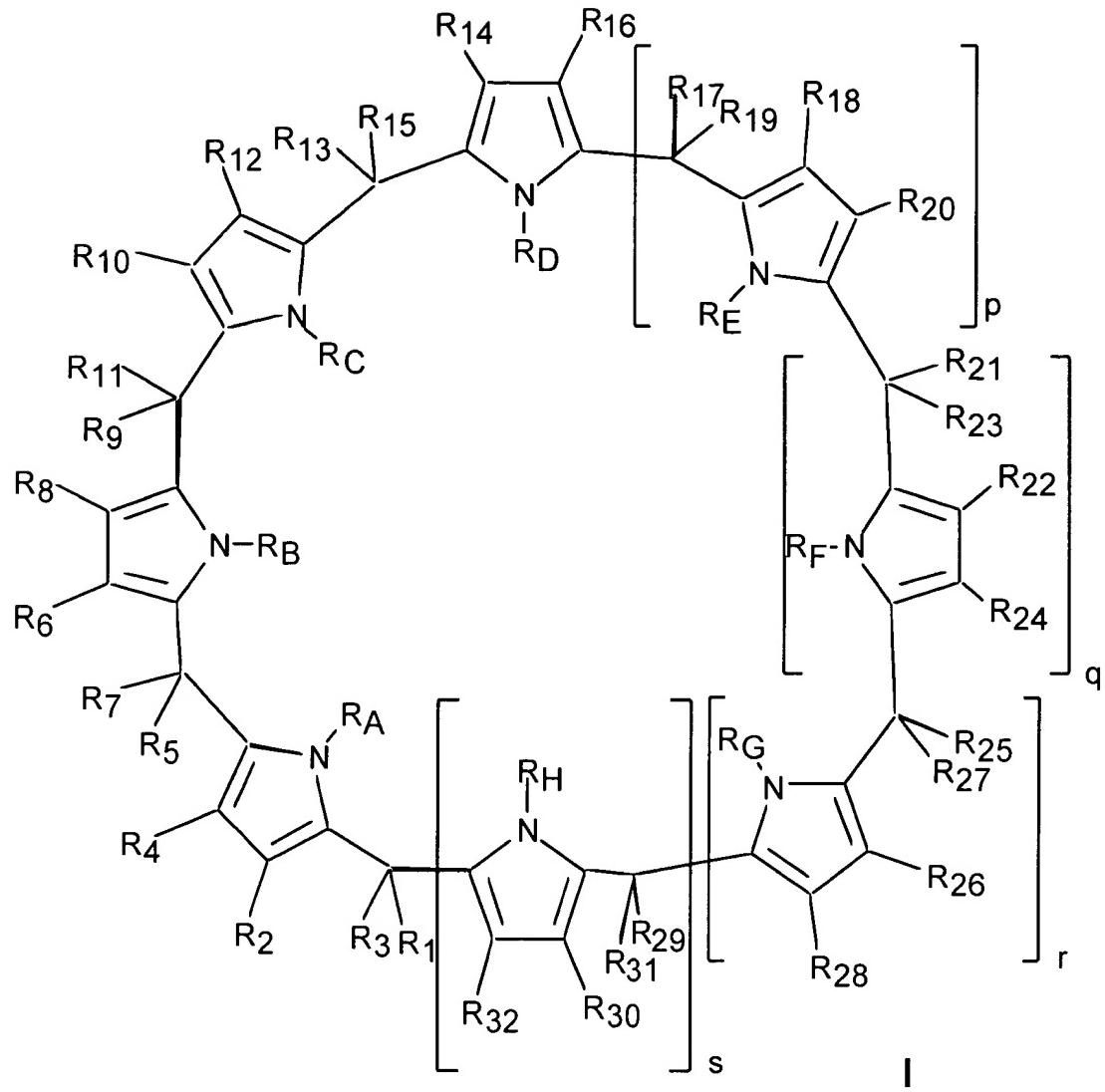
Date: February 28, 2002

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**ATTACHMENT A**  
**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

Claims 2, 3, 5-90, and 92-94 are canceled. Claims 1, 4, and 91 are amended as indicated below. Language added is underlined and language deleted is lined through.

1. (Amended) A composition comprising a calix[n]pyrrole macrocycle that has n pyrrole rings linked in  $\alpha$  positions via sp<sup>3</sup> hybridized meso-carbon atoms, the meso-carbon atoms bound to an atom other than hydrogen, where n is 4, 5, 6, 7, or 8; ~~or a calix[m]pyridino[n]pyrrole macrocycle where m + n is 4, 5, 6, 7, or 8 and m and n are other than zero;~~ the macrocycle noncovalently-complexed to a molecular or anionic species.
  
4. (Amended) The composition macrocycle of claim 1, 2, or 3 wherein the macrocycle is a calix[n]pyrrole and the calix[n]pyrrole macrocycle has structure I:



wherein

when n is 4, p = q = r = s = 0, R<sub>1</sub> - R<sub>16</sub> are independently substituents as listed in paragraph i) below, and R<sub>A</sub> - R<sub>D</sub> are independently substituents as listed

in paragraph ii) below;

when n is 5, p = 1, q = r = s = 0, R<sub>1</sub> to R<sub>20</sub> are independently substituents as listed in paragraph i) below, and R<sub>A</sub> - R<sub>E</sub> are independently substituents as listed in paragraph ii) below;

when n is 6, p = q = 1, r = s = 0, R<sub>1</sub> to R<sub>24</sub> are independently substituents as listed in paragraph i) below, and R<sub>A</sub> - R<sub>F</sub> are independently substituents as listed in paragraph ii) below;

when n is 7, p = q = r = 1, s = 0, R<sub>1</sub> to R<sub>28</sub> are independently substituents as listed in paragraph i) below, and R<sub>A</sub> - R<sub>G</sub> are independently substituents as listed in paragraph ii) below;

when n is 8, p = q = r = s = 1, R<sub>1</sub> to R<sub>32</sub> are independently substituents as listed in paragraph i) below, and R<sub>A</sub> - R<sub>H</sub> are independently substituents as listed in paragraph ii) below;

- i) hydrogen, halide, hydroxyl, alkyl, alkenyl, alkynyl, aryl, alkylaryl, nitro, phospho, formyl, acyl, hydroxyalkyl, alkoxy, hydroxyalkoxy, hydroxyalkenyl, hydroxyalkynyl, saccharide, carboxy, carboxyalkyl, carboxamide, carboxamidealkyl, amino, amido, aminoalkyl, phosphoalkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, tetrahydropyran, tetrahydrothiopyran, thioalkyl, haloalkyl, haloalkenyl, haloalkynyl, alkyl ester, a site-directing molecule, a catalytic group, a reporter group, a binding agent, or a couple that is coupled to a site-directing molecule, to a catalytic group, to a reporter group, or to a binding agent;
- ii) hydrogen, alkyl, aminoalkyl, alkylsulfone, carboxy alkyl, carboxamidealkyl, phospho alkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, haloalkyl, aryl, N-oxide, dialkylamino, carbamate, or arylsulfonyl;

or

~~at least two substituents are coupled to form a bridged structure, and when coupled to form a bridged structure, nonbridged substituents are as defined herein in paragraph i) or ii);~~

wherein odd-numbered R-substituents are other than hydrogen.

91. (Amended) A composition comprising a calix[m]pyridino[n]pyrrole macrocycle that has m pyridine rings and n pyrrole rings linked in  $\alpha$  positions via sp<sup>3</sup> hybridized meso-carbon atoms, the meso-carbon atoms bound to an atom other than hydrogen, where m + n is 4, 5, 6, 7, or 8 and m and n are other than 1 and 3 or 2 and 2, respectively; ~~or a calix[m]pyridine macrocycle where m is 4, 5, 6, 7, or 8;~~ the macrocycle noncovalently complexed to a molecular or cationic species.

Add Claims 95-117 as follows.

--95. The composition of Claim 4 wherein at least two substituents of paragraph i) or ii) are coupled to form a bridged structure, and when coupled to form a bridged structure, nonbridged substituents are as defined in paragraph i) or ii).

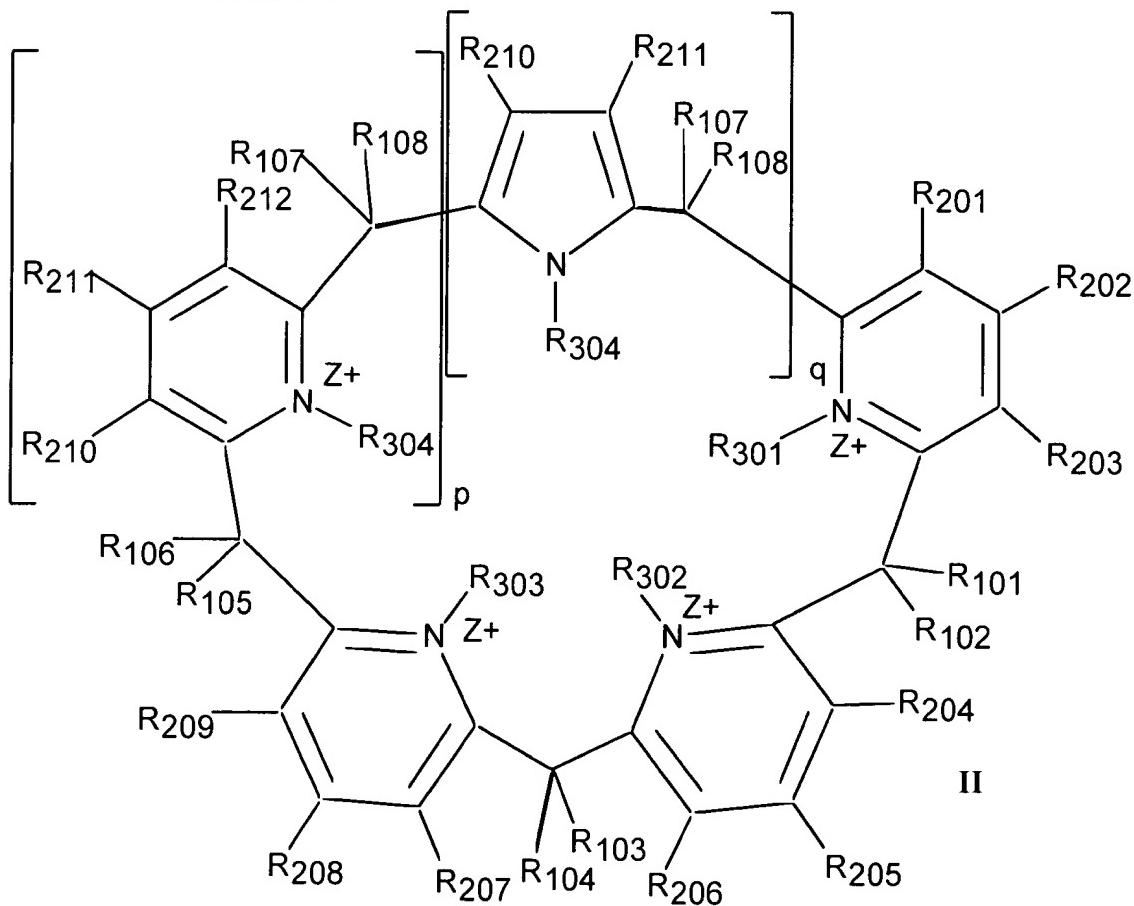
96. The composition of Claim 4 wherein the calix[n]pyrrole macrocycle is  $\beta$ -substituted where at least one even-numbered R-substituent is other than hydrogen.
97. The composition of Claim 4 wherein at least one odd numbered R substituent is carboxy.
98. The composition of Claim 4 wherein at least one odd numbered R substituent is alkyl ester.
99. The composition of Claim 4 wherein at least one even numbered R substituent is carboxy.
100. The composition of Claim 4 wherein at least one even numbered R substituent is alkyl ester.
101. The composition of Claim 1 where the macrocycle is complexed with an anionic species and the anionic species is a halide anion.
102. The composition of Claim 101 wherein the halide anion is chloride.
103. The composition of Claim 101 wherein the halide anion is fluoride.
104. The composition of Claim 1 where the macrocycle is complexed with an anionic species and the anionic species is a molecule containing a phosphate.
105. The composition of Claim 1 where the macrocycle is complexed with an anionic species and the anionic species is an oxoanion.
106. The composition of Claim 1 where the macrocycle is complexed with an anionic species and the anionic species is a radioactive anion.
107. The composition of Claim 1 where the macrocycle is complexed with a molecular species and the molecular species is an alcohol.
108. The composition of Claim 1 where the macrocycle is complexed with a molecular species and the molecular species is urea.

109. The composition of Claim 1 where the macrocycle is complexed with a molecular species and the molecular species is an ion pair.

110. The composition of Claim 1 where the macrocycle is complexed with a molecular species and the molecular species is a zwitterion.

111. A composition comprising a calix[m]pyridino[n]pyrrole macrocycle that has m pyridine rings and n pyrrole rings linked in  $\alpha$  positions via  $sp^3$  hybridized *meso*-carbon atoms, the *meso*-carbon atoms bound to an atom other than hydrogen, where  $m + n$  is 4, 5, 6, 7, or 8 and m and n are other than zero; the macrocycle noncovalently-complexed to a molecular or anionic species forming a supramolecular ensemble.

112. The composition of Claim 111 wherein the calix[m]pyridino[n]pyrrole macrocycle has structure II:



wherein m designates a number of pyridines in the macrocycle and n designates a number of pyrroles in the macrocycle;

$m+n=4$ ;

$m$  is other than 1 or 2;

when  $m$  is 4,  $n = 0$ ,  $p = 1$ ,  $q = 0$ ,  $R_{101}$  to  $R_{108}$  and  $R_{201}$  to  $R_{212}$  are independently substituents as listed in paragraph i) below, and  $R_{301}$  -  $R_{304}$  are independently substituents as listed in paragraph ii) below;

when  $m$  is 3,  $n = 1$ ,  $p = 0$ ,  $q = 1$ ,  $R_{101}$  to  $R_{108}$  and  $R_{201}$  to  $R_{211}$  are independently substituents as listed in paragraph i) below, and  $R_{301}$  -  $R_{304}$  are independently substituents as listed in paragraph ii) below;

i) hydrogen, halide, hydroxyl, alkyl, alkenyl, alkynyl, aryl, alkylaryl, nitro, phospho, formyl, acyl, hydroxyalkyl, alkoxy, hydroxylalkoxy, hydroxyalkenyl, hydroxyalkynyl, saccharide, carboxy, carboxyalkyl, carboxamide, carboxamidealkyl, amino, amido, aminoalkyl, phosphoalkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, tetrahydropyran, tetrahydrothiopyran, thioalkyl, haloalkyl, haloalkenyl, haloalkynyl, alkyl ester, a site-directing molecule, a catalytic group, a reporter group, a binding agent, or a couple that is coupled to a site-directing molecule, to a catalytic group, to a reporter group, or to a binding agent;

ii) a lone pair of electrons, hydrogen, alkyl, aminoalkyl, alkylsulfone, carboxy alkyl, carboxamidealkyl, phospho alkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, halo alkyl, aryl, N-oxide, dialkylamino, carbamate, or arylsulfonyl;

or

at least two substituents are coupled to form a bridged structure, and when coupled to form a bridged structure, nonbridged substituents are as defined herein in paragraph i) or ii);

wherein  $R_{101}$ - $R_{108}$  are other than hydrogen;

wherein when  $R_{301}$ - $R_{304}$  is other than a lone pair of electrons,  $Z$  is 1;

wherein when  $R_{301}$ - $R_{304}$  is a lone pair of electrons,  $Z$  is 0.

113. The composition of Claim 111 where

$m+n=5$ , 6, 7, or 8;

each pyridine or pyrrole  $\alpha$ -carbon is bound to another pyridine or pyrrole  $\alpha$ -carbon *via* one non hydrogen-linked  $sp^3$  hybridized *meso*-carbon;

each  $sp^3$  hybridized *meso*-carbon is further independently bonded to a halide, hydroxyl, alkyl, alkenyl, alkynyl, aryl, alkylaryl, nitro, phospho, formyl, acyl, hydroxyalkyl, alkoxy, hydroxyalkoxy, hydroxyalkenyl, hydroxyalkynyl, saccharide, carboxy, carboxyalkyl, carboxamide, carboxamidealkyl, amino, amido, aminoalkyl, phosphoalkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, tetrahydropyran, thioalkyl, haloalkyl, haloalkenyl, haloalkynyl or alkyl ester group; to a site-directing molecule; to a catalytic group; to a reporter group; to a binding agent; or to a couple that is coupled to a site-directing molecule, to a catalytic group, to a reporter group, or to a binding agent;

each pyridine  $\beta$  carbon, pyrrole  $\beta$  carbon and pyridine  $\gamma$  carbon is independently bonded to a hydrogen, halide, hydroxyl, alkyl, alkenyl, alkynyl, aryl, alkylaryl, nitro, phospho, formyl, acyl, hydroxyalkyl, alkoxy, hydroxyalkoxy, hydroxyalkenyl, hydroxyalkynyl, saccharide, carboxy, carboxyalkyl, carboxamide, carboxamidealkyl, amino, amido, aminoalkyl, phosphoalkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, tetrahydropyran, thioalkyl, haloalkyl, haloalkenyl, haloalkynyl, alkyl ester group; to a site-directing molecule; to a catalytic group; to a reporter group; to a binding agent; or to a couple that is coupled to a site-directing molecule; to a catalytic group; to a reporter group, or to a binding agent;

each pyridine or pyrrole nitrogen is bound to a lone pair of electrons, hydrogen, alkyl, aminoalkyl, alkylsulfone, carboxy alkyl, carboxamidealkyl, phospho alkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, halo alkyl, aryl, N-oxide, dialkylamino, carbamate, or arylsulfonyl;

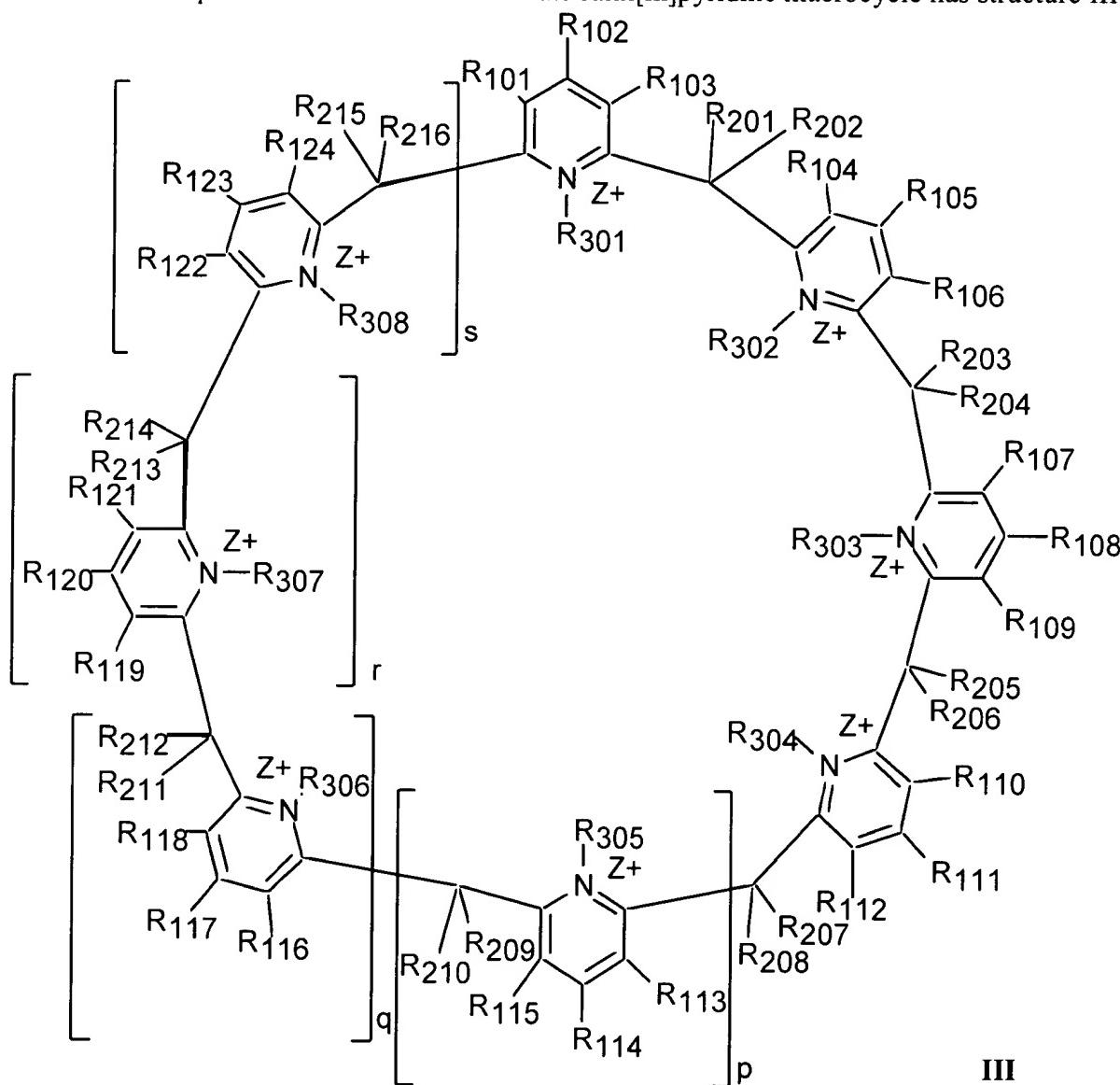
or

at least one  $sp^3$  hybridized *meso*-carbon, pyridine  $\beta$ -carbon, pyrrole  $\beta$ -carbon, pyridine  $\gamma$  carbon, pyrrole nitrogen or pyridine nitrogen is coupled to form a bridged structure to itself or to another  $sp^3$  hybridized *meso*-carbon, pyridine  $\beta$ -carbon, pyrrole  $\beta$ -carbon,

pyridine  $\gamma$  carbon, pyrrole nitrogen, or pyridine nitrogen; and when coupled to form a bridged structure, non-bridged atoms are as defined for an  $sp^3$  hybridized *meso*-carbon, pyridine  $\beta$ -carbon, pyrrole  $\beta$ -carbon, pyridine  $\gamma$  carbon, pyrrole nitrogen, or pyridine nitrogen.

114. A composition comprising a calix[m]pyridine macrocycle that has m pyridine rings linked in  $\alpha$  positions via sp<sup>3</sup> hybridized *meso*-carbon atoms, the *meso*-carbon atoms bound to an atom other than hydrogen, where m is 4, 5, 6, 7, or 8; the macrocycle noncovalently complexed to a molecular or cationic species.

115. The composition of Claim 114 wherein the calix[m]pyridine macrocycle has structure III:



wherein m is 4, 5, 6, 7 or 8;

when m is 4, p = q = r = s = 0, R<sub>101</sub> to R<sub>112</sub> and R<sub>201</sub> to R<sub>208</sub> are independently substituents as listed in paragraph i) below, and R<sub>301</sub> - R<sub>304</sub> are independently substituents as listed in paragraph ii) below;

when m is 5, p = 1, q = r = s = 0, R<sub>101</sub> to R<sub>115</sub> and R<sub>201</sub> to R<sub>210</sub> are independently substituents as listed in paragraph i) below, and R<sub>301</sub> - R<sub>305</sub> are independently substituents as listed in paragraph ii) below;

when m is 6, p = q = 1, r = s = 0, R<sub>101</sub> to R<sub>118</sub> and R<sub>201</sub> to R<sub>212</sub> are independently substituents as listed in paragraph i) below, and R<sub>301</sub> - R<sub>306</sub> are independently substituents as listed in paragraph ii) below;

when m is 7, p = q = r = 1, s = 0, R<sub>101</sub> to R<sub>121</sub> and R<sub>201</sub> to R<sub>214</sub> are independently substituents as listed in paragraph i) below, and R<sub>301</sub> - R<sub>307</sub> are independently substituents as listed in paragraph ii) below;

when m is 8, p = q = r = s = 1, R<sub>101</sub> to R<sub>124</sub> and R<sub>201</sub> to R<sub>216</sub> are independently substituents as listed in paragraph i) below, and R<sub>301</sub> - R<sub>308</sub> are independently substituents as listed in paragraph ii) below;

i) hydrogen, halide, hydroxyl, alkyl, alkenyl, alkynyl, aryl, alkylaryl, nitro, phospho, formyl, acyl, hydroxyalkyl, alkoxy, hydroxyalkoxy, hydroxyalkenyl, hydroxyalkynyl, saccharide, carboxy, carboxyalkyl, carboxamide, carboxamidealkyl, amino, amido, aminoalkyl, phosphoalkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, tetrahydrotetrapyrany, thioalkyl, haloalkyl, haloalkenyl, haloalkynyl, alkyl ester, a site-directing molecule, a catalytic group, a reporter group, a binding agent, or a couple that is coupled to a site-directing molecule, to a catalytic group, to a reporter group, or to a binding agent;

ii) a lone pair of electrons, hydrogen, alkyl, aminoalkyl, alkylsulfone, carboxy alkyl, carboxamidealkyl, phospho alkyl, alkyl sulfoxide, alkyl sulfone, alkyl sulfide, halo alkyl, aryl, N-oxide, dialkylamino, carbamate, or arylsulfonyl; and

or

at least two substituents are coupled to form a bridged structure, and when coupled to form a bridged structure, nonbridged substituents are as defined herein in paragraph i) or ii) other than for bridged substituents;

wherein R<sub>201</sub>-R<sub>216</sub> are other than hydrogen;

wherein when R<sub>301</sub>-R<sub>30m</sub> is other than a lone pair of electrons, Z is 1; and

wherein when R<sub>301</sub>-R<sub>30m</sub> is a lone pair of electrons, Z is 0.

116. The composition of Claim 91 wherein the macrocycle is complexed with a cationic species and the cationic species is a lanthanide or actinide cation.

117. The composition of Claim 114 wherein the macrocycle is complexed with a cationic species and the cationic species is a lanthanide or actinide cation.--